



US007463109B2

(12) **United States Patent**
Iio

(10) **Patent No.:** **US 7,463,109 B2**
(45) **Date of Patent:** **Dec. 9, 2008**

(54) **APPARATUS AND METHOD FOR
WAVEGUIDE TO MICROSTRIP TRANSITION
HAVING A REDUCED SCALE BACKSHORT**

(75) Inventor: **Kenichi Iio**, Nishinomiya (JP)

(73) Assignee: **Furuno Electric Company Ltd.**, Hyogo
Pref. (JP)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 69 days.

(21) Appl. No.: **11/404,903**

(22) Filed: **Apr. 17, 2006**

(65) **Prior Publication Data**

US 2006/0255875 A1 Nov. 16, 2006

Related U.S. Application Data

(60) Provisional application No. 60/672,009, filed on Apr.
18, 2005.

(51) **Int. Cl.**
H01P 5/107 (2006.01)

(52) **U.S. Cl.** **333/26; 333/33**

(58) **Field of Classification Search** **333/26,**
333/33

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,235,300 A * 8/1993 Chan et al. 333/247
5,912,598 A 6/1999 Stones et al.
6,002,305 A 12/1999 Sanford et al.

6,242,984 B1 * 6/2001 Stones et al. 330/295
6,707,348 B2 3/2004 Ammar
6,967,542 B2 * 11/2005 Weinstein 333/26
7,148,766 B2 * 12/2006 Tong et al. 333/26
2005/0200424 A1 * 9/2005 Takeda et al. 333/26

FOREIGN PATENT DOCUMENTS

JP 60-230701 11/1985
JP 2003-298322 10/2003
JP 2005-318632 11/2005

* cited by examiner

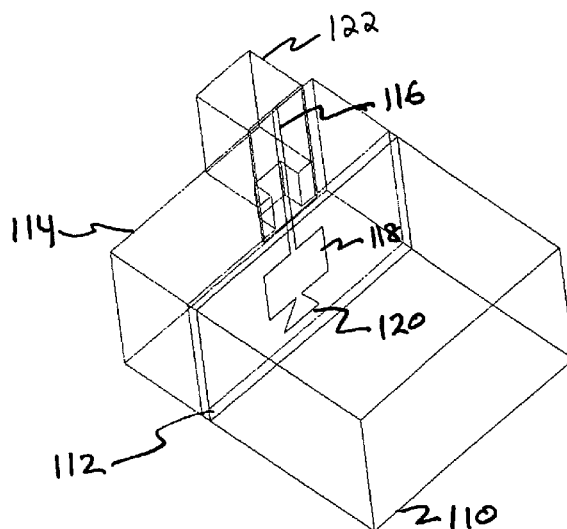
Primary Examiner—Benny Lee

(74) *Attorney, Agent, or Firm*—Birch, Stewart, Kolasch &
Birch, LLP

(57) **ABSTRACT**

Methods and apparatuses are directed to a transition between a waveguide and a microstrip. One embodiment features an open-ended waveguide having an exposed side at a distal end, a substrate coupled to the open-ended waveguide at a proximate end, a resonator coupled to the substrate, a microstrip line electromagnetically coupled to the resonator, and a backshort coupled to the substrate. Another embodiment features receiving an electromagnetic wave, collecting an incident portion of the received electromagnetic wave, generating first wave having a resonance at a predetermined frequency using the incident portion of the received electromagnetic wave, reflecting a portion of the received electromagnetic wave off of a reduced scale backshort, back towards a collector, generating a second wave having a resonance at a predetermined frequency using the reflected portion of the received electromagnetic wave, and combining the first wave and the second wave in phase.

13 Claims, 17 Drawing Sheets



100